

Review of the California Ambient Air Quality Standards for Particulate Matter and Sulfates



Air Resources Board



**Office of Environmental
Health Hazard Assessment**

California Environmental Protection Agency

OVERVIEW

- **Purpose of standards reviews**
- **Elements of air standards**
- **Particulate Matter (PM)--what it is and why we are concerned**
- **Proposed Recommendations**
- **Health Basis of Recommendations**

PURPOSE OF STANDARD REVIEW

- **Determine whether standards adequately protect public health**
- **Address need of Children's Environmental Health Protection Act (SB25, Escutia, 1999)**

CHILDREN'S ENVIRONMENTAL HEALTH PROTECTION ACT REVIEW REQUIREMENTS

- **Determine which standards not protective of public health**
- **Prioritize review of those standards determined inadequate**
- **Revise highest priority standard by Dec. 2002**

RESULTS OF 2000 STANDARD PRIORITIZATION PROCESS

1st Priority:

- PM10 (including sulfates)
- Ozone
- Nitrogen dioxide

2nd Priority:

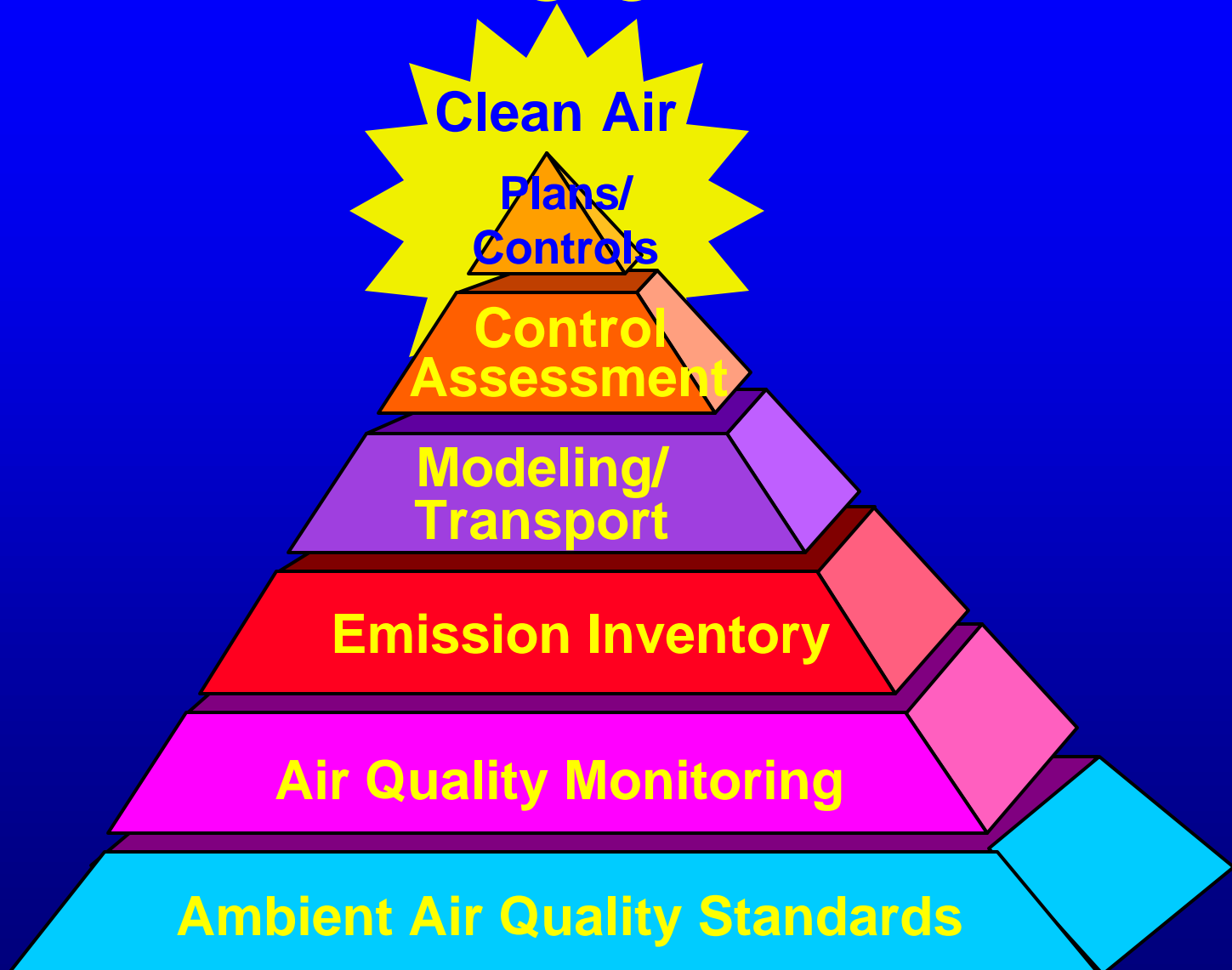
- Lead
- Hydrogen sulfide
- Sulfur dioxide
- Carbon monoxide

“Adequacy of CA Ambient Air Quality Standards: Children’s Environmental Health Protection Act,” December 2000.

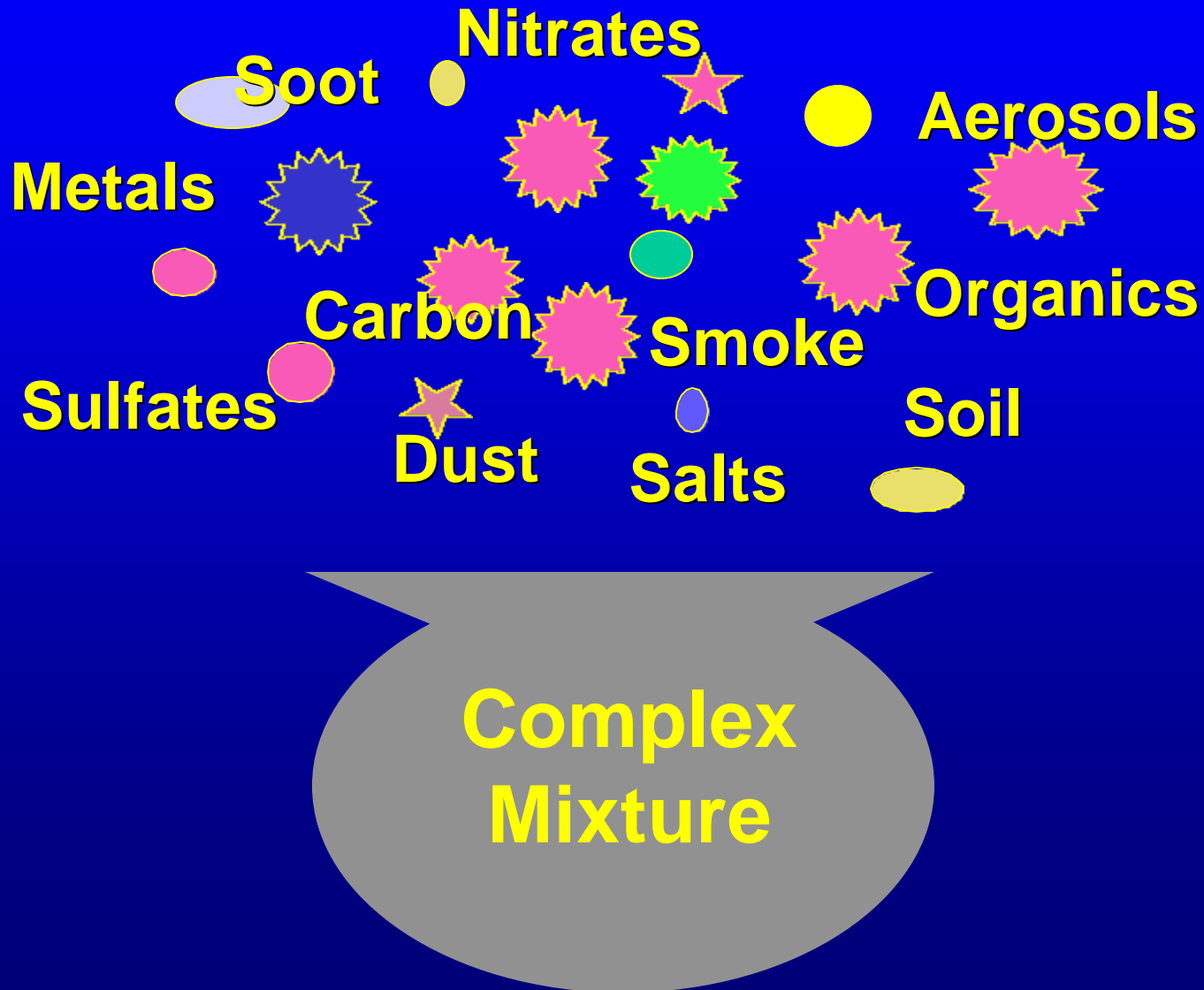
WHAT IS AN AMBIENT AIR QUALITY STANDARD?

- Legal definition of clean air
- Establish maximum allowable levels to protect your health and welfare
- Elements:
 - Definition of the pollutant
 - Averaging time
 - Concentration
 - Monitoring method

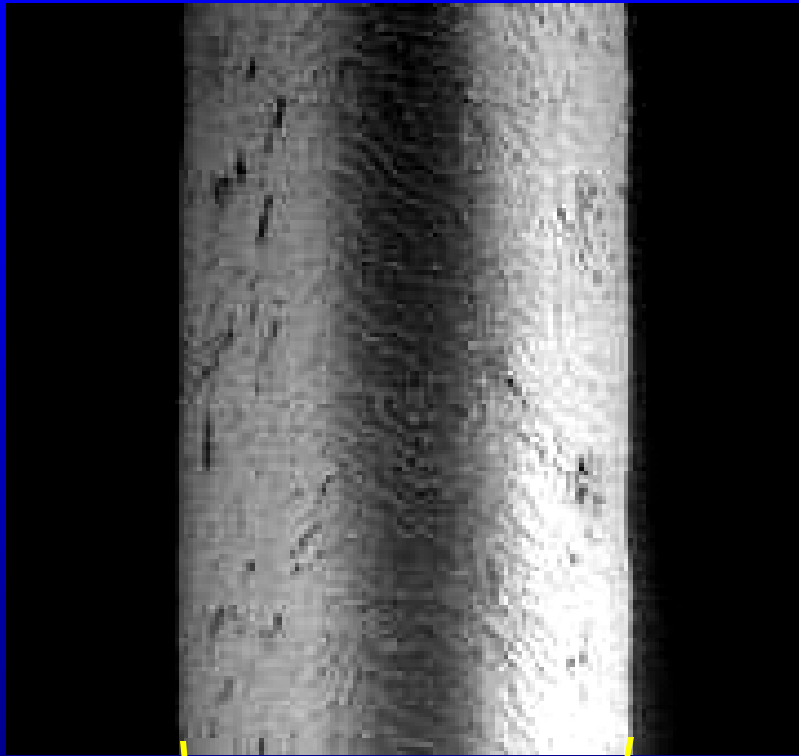
THE PATH TO CLEAN AIR



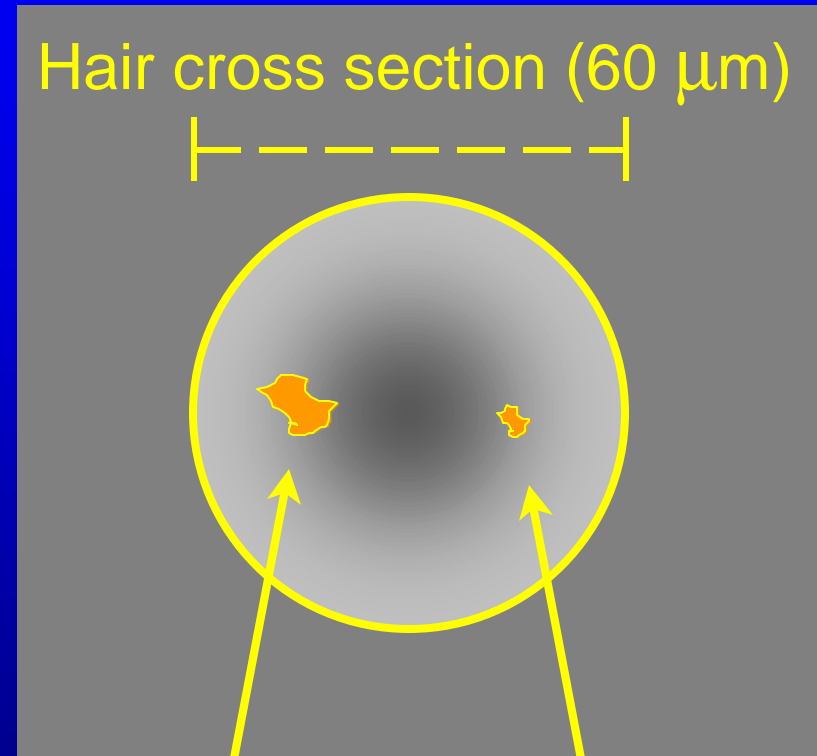
WHAT IS PARTICULATE MATTER?



HOW SMALL IS PM?



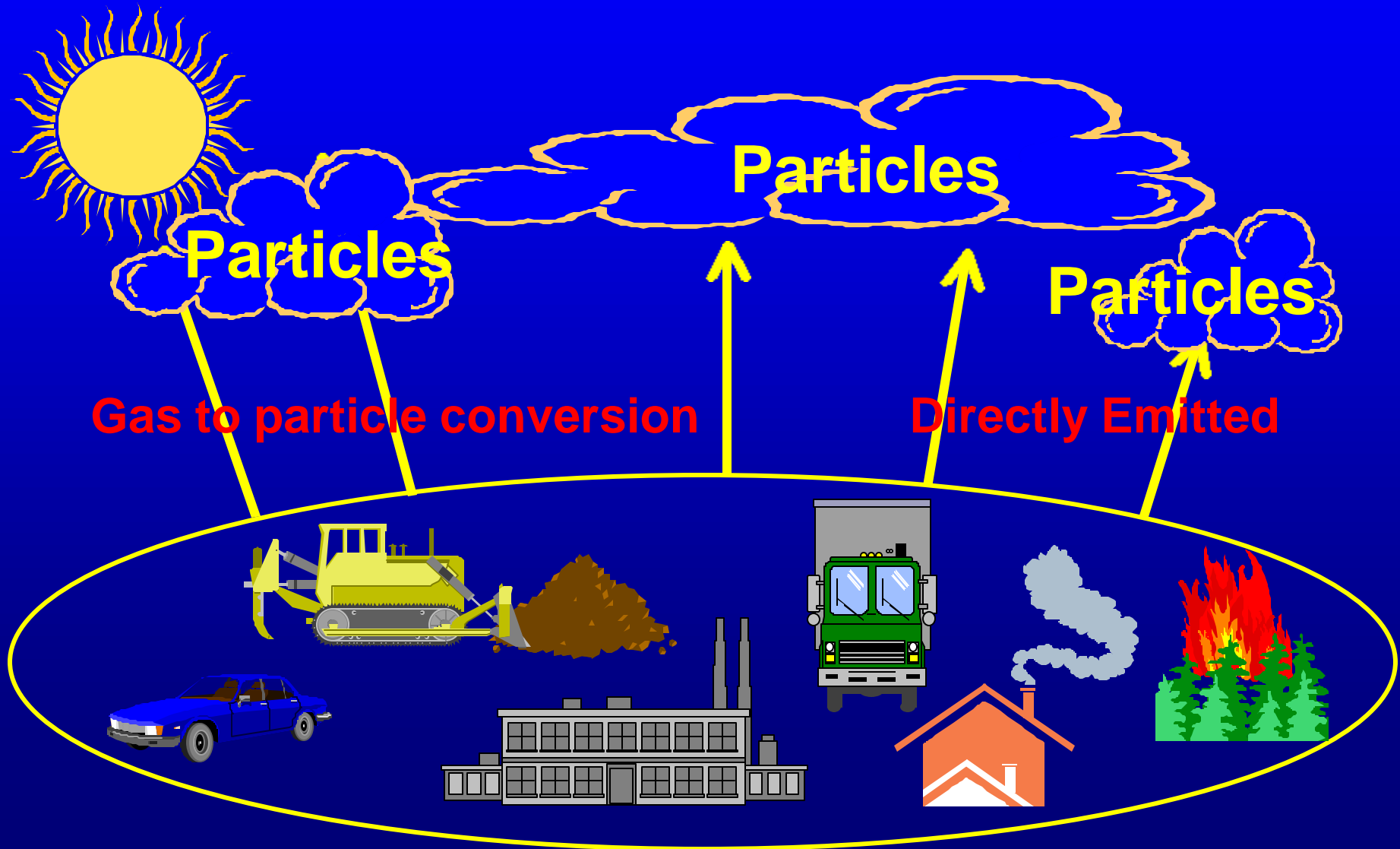
Human Hair
(60 μm diameter)



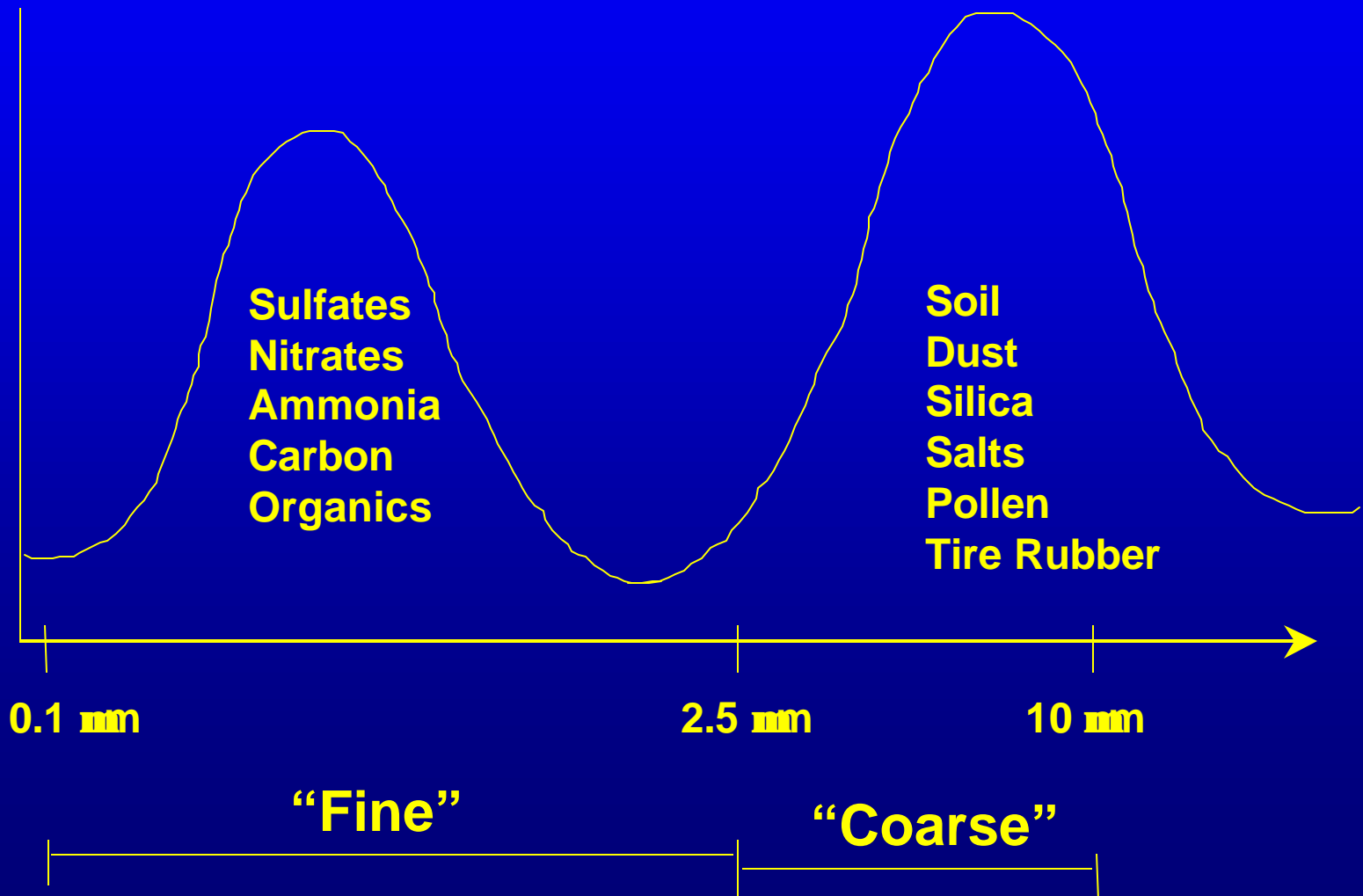
PM10
(10 μm)

PM2.5
(2.5 μm)

WHERE DO PARTICLES COME FROM?



PM10 AND PM2.5 SIZE VS. COMPOSITION



WHY ARE WE CONCERNED ABOUT PARTICLES?

- **HEALTH**

- Health effects are significant
 - Premature death and cardiorespiratory disease
- Body of evidence is substantial

- **WELFARE**

- Reduced visibility

CURRENT CA PM10 AND SULFATES STANDARDS

PM10

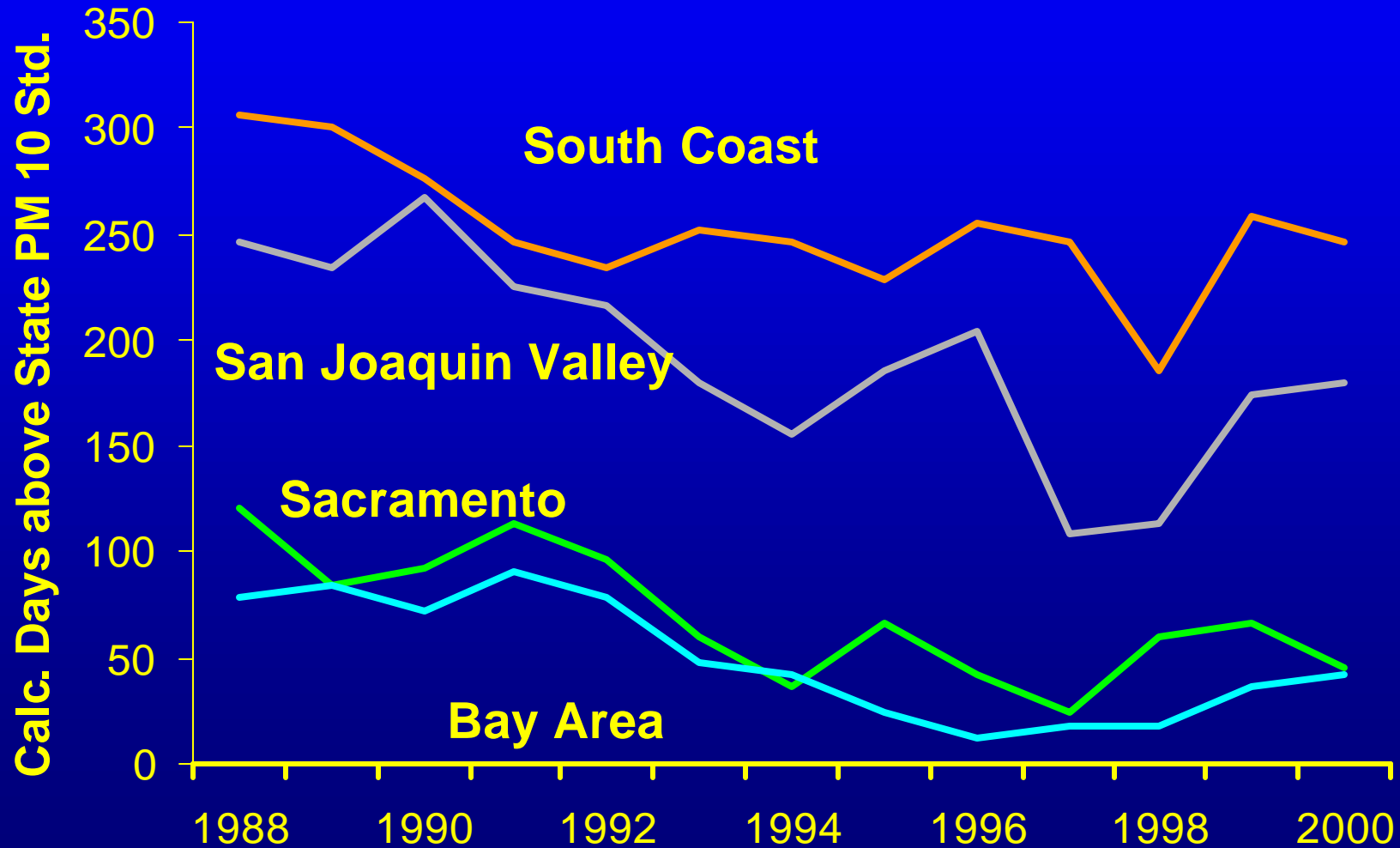
Annual Average	30 mg /m ³
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24-Hour Average	50 mg /m ³
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SULFATES

24-Hour Average	25 mg /m ³
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DAYS OF UNHEALTHY PM₁₀ LEVELS



STEPS TOWARD NEW PM STANDARDS

Nov. 2001	Public Draft Report released
Dec. 2001	Public workshops
Jan. 2002	Air Quality Advisory Committee meeting (Jan. 23 & 24)
March 2002	Final Draft Report released
May 2002	Board Hearing

RECOMMENDATIONS FOR PM AMBIENT AIR QUALITY STANDARDS

- PM10** – Reduce annual average from 30 to 20 mg/m^3
- Retain 24-hour standard of 50 mg/m^3
- PM2.5** – Add an annual average standard of 12 mg/m^3
- Sulfates** – Retain 24-hour average standard of 25 mg/m^3 ; propose alternate monitoring method

RECOMMENDATIONS FOR MONITORING METHODS

- **Adopt the existing Federal Reference Methods (FRMs) for PM10 (not Equivalent Methods)**
- **Adopt existing FRM for PM2.5**
- **Use ARB Method 007 for PM10 sulfate**
- **Possibly designate continuous methods as acceptable for PM10 and for PM2.5**
- **Retain provision for identification of other methods, acceptable to ARB**

AMBIENT AIR QUALITY STANDARDS ARE BASED ON EPIDEMIOLOGICAL STUDIES

- **Use real-world exposures and health responses**
- **Can examine different segments of the population (e.g., elderly, asthmatics, children)**
- **Use statistical associations to infer effects of air pollution**

PM EPIDEMIOLOGY STUDIES -- SHORT-TERM EXPOSURES

- **Studies of PM and mortality conducted in over 200 cities**
- **Examine associations between daily concentrations of PM and daily death counts**
- **Studies account for weather extremes, seasonal effects, day of week, co-pollutants, and other factors**

PM EPIDEMIOLOGY STUDIES -- SHORT-TERM EXPOSURE RESULTS

- **Consistent associations between daily averages of PM10 and mortality**
- **Associations also reported between daily PM10 and many measures of illness**
 - **cardiorespiratory hospitalizations**
 - **emergency room visits**
 - **school absenteeism**
 - **asthma attacks**
 - **bronchitis & other respiratory symptoms in children**
 - **decreased lung function**

PM EPIDEMIOLOGY STUDIES -- LONG-TERM EXPOSURE

- **Several studies report associations between mortality and long-term exposure to PM10 and/or PM2.5**
- **Analysis accounts for relevant individual-level factors (e.g., smoking, weight, alcohol, occupational exposure, gender, age, and others)**
- **The largest involves the American Cancer Society cohort of roughly 550,000 individuals in 151 cities**

PM EPIDEMIOLOGY STUDIES -- LONG-TERM EXPOSURE RESULTS

- **Chronic exposure to air pollution corresponding to the difference between the most and least polluted cities in the U.S., might decrease average life expectancy by about 1.5 years**
- **Each death from diseases associated with air pollution is estimated to significantly shorten life**

GENERAL RATIONALE FOR PM STANDARDS

- **PM10 standards introduced in California in 1983**
- **Hundreds of studies published since then, confirming linkages with mortality and other adverse health effects at low levels**
- **Recent studies suggest effects from both fine and coarse particles**

RATIONALE FOR ANNUAL AVERAGE STANDARDS

- **Greatest impact on mortality due to chronic rather than acute exposure**
- **Primary focus on reducing long-term exposures by lowering PM10 annual average and adding PM2.5 annual average**

RATIONALE FOR 24-HR STANDARDS

- **Some areas attaining annual standard will still have episodic PM elevations – need for short-term standard (PM10 - 24 hours)**
- **Difficult to disentangle effects of chronic exposure from acute effects**

RATIONALE FOR SULFATE STANDARD

- **Health evidence for sulfates less consistent than that for PM10 and PM2.5**
- **Strongly acidic sulfates comprise a small percentage of PM10 and PM2.5 in California**
- **Sulfate concentrations in California far lower than current standard**

EXPECTED HEALTH BENEFITS FROM ATTAINING ANNUAL AVERAGE STANDARDS

**Change to proposed annual average PM10
standard estimated to prevent about:**

- 6,500 (95% C.I. = 3,200 – 9,800) deaths/year**
- 3,100 cardiovascular and 2,900 respiratory hospitalizations among those older than 65**
- 1,000 asthma hospitalizations among those younger than 65**
- 389,000 lower respiratory symptoms among children aged 7 – 14**

ADDITIONAL INFORMATION

ARB PM standard review website:
<http://arbis.arb.ca.gov/research/aaqs/std-rs/std-rs.htm>

Public comments for this draft version due by
January 11, 2002.

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